

High Performance Nozzle for Mars Ascent Vehicle, Phase I

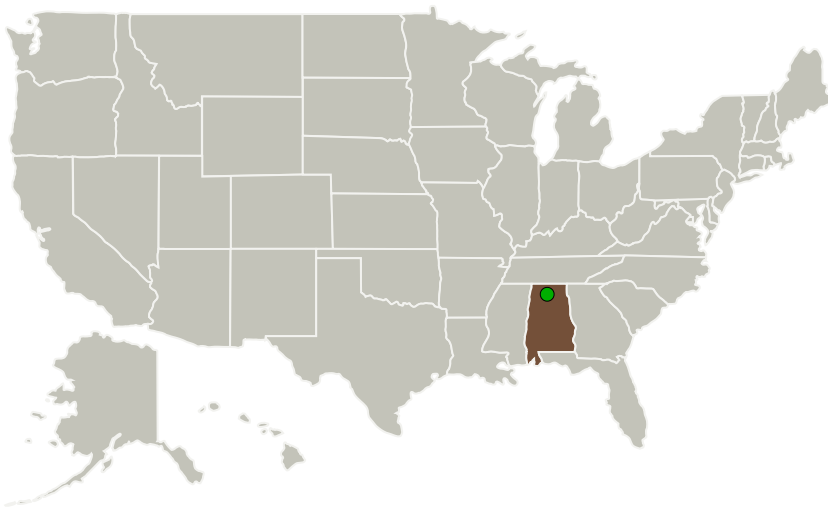
Completed Technology Project (2015 - 2015)



Project Introduction

ASTS is pleased to propose to demonstrate the feasibility of using an aerospike nozzle to provide a dramatic increase in payload capability to the two-stage, all-solid-propulsion Mars Ascent Vehicle (MAV). The aerospike features a well-known altitude compensation capability, but the MAV operates in near-vacuum conditions so cannot take advantage of that aspect. Instead, the aerospike nozzle, at a comparable ~200:1 area ratio as is currently baselined for MAV, will be considerably shorter than a traditional bell nozzle. Thus, for a fixed motor length, a shorter aerospike nozzle will allow us to lengthen the motor case itself, thereby enabling us to load a substantial amount of additional propellant than the baseline. The resultant improvement in propellant fraction will provide significantly higher payload performance compared to the baseline--our preliminary calculations show that up to 40% additional propellant can be added to the each motor.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
ASRC Federal Astronautics, LLC	Lead Organization	Industry	Huntsville, Alabama
 Marshall Space Flight Center (MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama



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Primary U.S. Work Locations

Alabama

Project Transitions

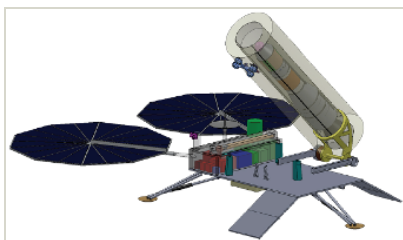
June 2015: Project Start

December 2015: Closed out

Closeout Documentation:

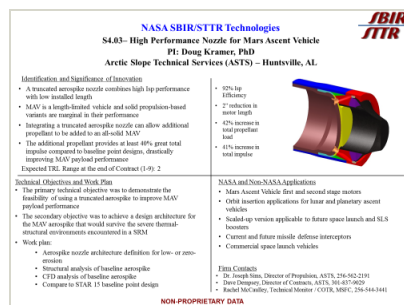
- Final Summary Chart(<https://techport.nasa.gov/file/139058>)

Images



Briefing Chart

High Performance Nozzle for Mars Ascent Vehicle Briefing Chart (<https://techport.nasa.gov/image/127574>)



Final Summary Chart Image

High Performance Nozzle for Mars Ascent Vehicle, Phase I Project Image (<https://techport.nasa.gov/image/134797>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ASRC Federal Astronautics, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

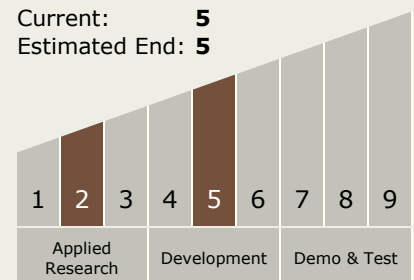
Carlos Torre

Principal Investigator:

Richard D Kramer

Technology Maturity (TRL)

Start: **2**
 Current: **5**
 Estimated End: **5**



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System